PSYCHOLOGICAL MOTIVATIONS AND PHYSICAL ACTIVITY IN THE CONTEXT OF WORKPLACE WELLNESS PROGRAMS

A Thesis

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ABSTRACT

Physical activity (PA) benefits both physical and mental health. Total PA encompasses four domains -- utilitarian, transportation, occupational, and leisure-time (LTPA)-- and engagement in each domain is inconsistently associated with health outcomes. For example, LTPA is positively associated with both physical and mental health; whereas, occupational PA is associated with better physical (but not mental) health. This thesis used self-determination theory to investigate associations between motivational needs for autonomy, competence and relatedness and domains of PA among workplace wellness physical activity program (WWPAP) participants and non-participants. Three distinct samples (WWPAP participants, follow-up WWPAP participants, and non-participants) completed separate electronic surveys that measured PA, motivations for PA, and socio-demographic characteristics; satisfaction of motivational needs also was measured among follow-up participants. Differences in characteristics between participants and non-participants suggest that the WWPAP is predominately serving people of higher education who hold faculty positions, and therefore is not serving the entire employee population. 82% of non-participants and 98% of follow-up WWPAP participants met the PA recommendations for Americans to engage in 150-minutes of moderate intensity PA every week. Total metabolic equivalent (MET) minutes of PA were lower among WWPAP participants as compared to non-participants. Higher total Met minutes of PA among non-participants largely was due to greater occupational PA. WWPAP participants had significantly greater MET minutes of LTPA (such as that provided by WWPAPs), but not enough to compensate for much lower occupational PA. Motivational needs for autonomy and competence were higher among WWPAP participants than non-participants and, among follow-up WWPAP participants, need for autonomy regarding PA was not satisfied. Non-participants, who primarily perform occupational PA, may not reap the potential positive mental health benefits achieved with LTPA like the opportunities available through WWPAPs. Differing characteristics, motivations, and behaviors of employees who voluntarily participate in a WWPAP and those who do not may inform the development of future workplace wellness programs to improve the participation of all employees. Therefore, workplace wellness programs should also address non-PA

options when creating programming. Future research should examine how participation in different components of the wellness program affects employee health and wellbeing.

BIOGRAPHICAL SKETCH

Hannah Feinberg is a registered dietitian nutritionist (RDN) and a student in the Master of Science in Nutritional Sciences program within Cornell University's Division of Nutritional Sciences. She earned a Bachelor of Science in Dietetics, Nutrition, and Food Sciences at the University of Vermont, and then completed a dietetic internship at Cornell University during which she interned at the Cornell University Wellness Program and the University of Rochester Medical Center. Her love for nutrition stems from competing as an elite triathlete in Division I and in two Ironman triathlons where she realized first-hand the direct effect nutrition has on sport performance. These experiences have led her to specialize in sports nutrition and, upon graduating, she will provide nutrition services to elite sailors campaigning for the America's Cup, Volvo Ocean Race, and the Olympic Games as the performance dietitian for the organization Sailing Performance Training.

Throughout her graduate studies, Hannah has enjoyed practicing as an RDN. She worked part-time at Cornell Wellness providing nutrition counseling to faculty, staff, retirees, and their spouses/partners, as well as at Sailing Performance Training providing nutrition consultations to professional sailors. In addition to practicing as an RDN, Hannah gained valuable experience as a teaching assistant for the courses Social Science Perspectives on Food and Nutrition; Introduction to Public Health; and Nutrition, Health, and Society. The combination of these professional experiences has deepened Hannah's passion for applying evidence-based nutrition to help individuals enhance their performance, improve their physical and mental health, and make positive and sustainable dietary and exercise behavior changes.

Hannah is a member of the Academy of Nutrition and Dietetics; New York State Academy of Nutrition and Dietetics; Southern Tier Academy of Nutrition and Dietetics, Sports, Cardiovascular and Wellness Nutrition Dietetic Practice Group; and Collegiate & Professional Sports Dietitian Association.

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Physical activity (PA)

Centers for Disease Control and Prevention (CDC)

National Health and Nutrition Examination Survey (NHANES)

Leisure-time physical activity (LTPA)

Socio-economic status (SES)

Workplace wellness programs (WWPs)

Health risk assessment (HRA)

University of Illinois Champaign-Urbana (UIUC)

Randomized controlled trial (RCT)

Self-determination theory (SDT)

University workplace wellness program (UWP)

Transtheoretical model (TTM)

International Physical Activity Questionnaire (IPAQ)

Workplace wellness physical activity program (WWPAP)

Metabolic equivalent-minute (MET-minute)

Revised Motivation for Physical Activity Measure (MPAM-R)

CHAPTER 1

INTRODUCTION AND REVIEW OF THE LITERATURE

In the past decade, Americans have experienced rising rates of obesity, cardiovascular disease, diabetes, and other chronic health conditions.[1] Currently, nearly half of American adults are diagnosed with one or more chronic diseases, which is projected to increase due to the nation's aging population coupled with high rates of modifiable risk factors (tobacco use, poor nutrition, low rates of physical activity(PA)).[2,3] By 2020 it is projected that chronic disease will account for almost three quarters of all deaths worldwide.[4] One modifiable risk factor to reduce the risk of chronic disease is PA.

The benefits to those who engage in PA are well understood and along with prevention of chronic disease include improved mental health, improved physical function, enhanced self-perceived heath, lower work absence due to illness, and higher work productivity.[5-7] Despite the known benefits, data from the Physical Activity Guidelines for Americans reports only 26% of men and 19% of women are meeting the aerobic and muscle-strengthening guidelines for adults ages 18 years or older.[8]

In an effort to improve the physical and financial health of the nation, the 2018 Physical Activity Guidelines for Americans were created to reverse the high rates of physical inactivity. These guidelines were developed by an appointed external scientific advisory committee and are issued by the U.S. Department of Health and Human Services. The guidelines are extensive and the pertinent recommendations for this thesis are as follows: American adults should aim to complete 150-300 minutes of moderate-intensity, or 75-150 minutes of vigorous aerobic activity every week.[8] Adherence to the above recommendations is associated with sustained health benefits including lower risks of all-cause mortality, chronic diseases, cancers, anxiety, depression, improved cognition, quality of life, sleep, and bone health.

Domains of Physical Activity

Individuals both intentionally and unintentionally engage in PA through many aspects of their days. Broadly defined, PA is "any bodily movement produced by skeletal muscles that results in energy expenditure."[9] Furthermore, PA can be classified by four domains: utilitarian, activity specific to chores and daily life; transportation, activity spent commuting; occupational, activity specific to work; and leisure-time, moderate or vigorous activity outside of daily life.[10] The benefits of total PA are well established and it is important to understand the effects of domain-specific PA on health outcomes.

Utilitarian PA has been declining as life has become more automated.[11] People with reduced utilitarian PA tend to spend time doing more sedentary activities instead because activities of daily living are requiring less energy input.[11] Evidence from the American Heritage Time Use Study that consisted of PA time-use data from women between 1965-2010 identified that time allocated to household management (preparing food, cleaning, laundry, general housework) decreased from 25.7 hours per week in 1965 to 13.3 hours per week in 2010.[12] To support that data, fewer Americans are physically active while cleaning their houses as iRobot estimates 20% of the overall vacuum market is made up of robot vacuums.[13] The above examples provide evidence that individuals must be more intentional about daily PA because human outputs of energy expenditure within activities of daily life are reduced.

Occupational PA has also declined. Data from the National Health and Nutrition Examination Survey (NHANES) show that the proportion of US workers employed in occupations requiring little physical input has dramatically increased since 1950.[6] This is evidenced by the significant increases in sedentary and lightly active service jobs (trade, administration, transportation, information, finance, professional, education, healthcare, etc.), and decreases in moderately active goods-producing and agricultural jobs (mining, logging, construction, manufacturing, farming) in the US.[11,14] When considering the physical inactivity in the workforce, decreases in occupation related energy expenditure equates to 140 fewer calories expended per day for men and 124 fewer calories expended per day for women.[14] Over

time, these decreases in PA while at work are one potential factor contributing to the weight gain seen in the US population.

Transportation PA trends suggest lower rates of activity are spent commuting by walking or cycling as compared to driving or using public transportation. Since 1950, there has been a steady increase in vehicles per licensed driver, daily driven vehicle miles per capita, and work trips by automobile, which has contributed to a significant reduction of PA spent commuting. On average in the US, 89.7% of trips outside the home are spent in automobile or public transit versus the 8.6% of trips outside the home that are spent walking.[11] Prior research suggests that geography and socioeconomic status is associated with one's accessibility to transportation PA, largely due to the accessibility of the community and built environment. For example, individuals who live in metropolitan areas have higher rates of transportation PA than those living in rural areas due to better access to sidewalks and seeing other people exercising.[15,16] Since many American's aren't moving their bodies as a mode of transportation, they must be intentional with the PA they engage in.

Leisure-time PA (LTPA) is any intentional moderate or vigorous PA outside of activities of daily living and is the primary type of PA recommended in the Physical Activity Guidelines for Americans. Between 1984 and 2015 the prevalence of LTPA in America has gradually declined by about 2% annually and currently about 75% of adult men and 22% of adult women are not meeting the LTPA recommendations.[8,17] LTPA does not necessarily correlate with exercise. For example, moderate intensity LTPA includes walking briskly, bicycling slower than 10 miles per hour, ballroom dancing, and gardening.[18] Vigorous intensity LTPA includes racewalking, jogging, running, swimming laps, aerobic dancing, bicycling faster than 10 miles per hour, jumping rope, landscaping, and hiking uphill.[18] One commonly cited barrier to meeting the LTPA guidelines is that working long hours (40 hours per week average in the United States, which has remained constant since the 1960s) reduces the opportunities to engage in PA at home.[11,14,19]

It is well demonstrated in the literature the positive effect total PA has on mental health, specifically with reductions of depression and anxiety.[20] However, studying total PA neglects the domain-specific PA effects on mental health outcomes. Of the four domains of PA, LTPA is the most strongly associated with improved mental health as compared to occupational, transportation, and utilitarian PA.[21] A large meta-analysis that assessed the mental health benefits of domain-specific PA found a positive association between LTPA and improved mental health where occupational PA was positively associated with poor mental health outcomes (higher depression and anxiety).[22] The effect of domain specific PAs on all-cause mortality were assessed in a highly powered systematic review of 80 studies and identified a decreasing risk of all-cause mortality by 26% in LTPA and 17% in occupational PA. These domain-specific PA differences are also associated with socio-economic status. A large study examining the associations between domains of PA and mental health in Flemish adults identified high rates of LTPA improved mental health in unemployed men and women and young adults with blue-collar jobs; high rates of utilitarian PA worsened mental health in women with blue-collar jobs but improved mental health in young adults with white-collar jobs; and transportation PA worsened mental health in men with blue-collar jobs.[21] These domain-specific differences must be considered when providing PA recommendations to population subgroups.

PA Differences by Socio-economic Status (SES)

A large body of evidence has identified potential associations between SES and PA. An inverse relationship between SES and PA is usually seen in the data. Often individuals with higher paying jobs and higher education hold sedentary, desk jobs, which results in lower rates of occupational PA than employees holding hourly, goods-producing jobs, such as in dining or facilities.[23] Another observation typically made is that lower-SES employees spend more time moving their bodies to get to public transportation to get to work, where higher-SES employees drive themselves.[10,24]

One metabolic advantage to being in a higher SES, is better access to LTPA. Employees with higher SES have higher LTPA than lower SES employees for two proposed reasons: higher paying salaried positions often provide more flexibility both within and outside of business hours, thus allowing more opportunities for purposeful PA; and they usually have more access to recreation and leisure-time resources/facilities, allowing safe engagement in PA.[25,26]

LTPA is the type of activity most frequently referenced in the PA Guidelines for Americans and by health-care practitioners, but it is important to note a combination of all four domains of PA can promote health, especially considering the influence SES has on engagement in one domain over another.

Persons in positions designing workplace PA programing must better understand the differences in PA domains by SES and occupation to raise the activity levels of all employees, to better serve their populations.

Workplace Wellness Programs (WWP)

The World Health Organization has identified the workplace as an ideal location to expand PA opportunities since Americans, amongst other nation's citizens, spend on average 44 hours per week, or 25% of all hours within a week, at work.[27,28,29] There have been increasing developments of WWPs, which are "a coordinated and comprehensive set of health promotion and protection strategies that are implemented at the worksite and include programs, policies, benefits, and environmental supports that are designed to encourage the health and safety of all employees."[30]

WWPs are becoming increasingly popular in the U.S. largely because employers perceive employees who participate in WWP have fewer medical expenditures, lower rates of absenteeism, and higher rates of productivity.[31-33] In the U.S. about half of all employers with at least 50 employees, and more than 90 percent of those with more than 50,000 employees, offered a WWP in 2012.[34] WWPs are

not standardized and what a WWP offers differs and may include gym memberships, nutrition and fitness consultations, insurance premium discounts, and/or financial incentives to participate, among other health and well-being programming.[35] Financial incentives may be awarded when participants complete health risk assessments (HRA), biometric screenings, or lifestyle and disease management programs.[35] Some WWPs have targeted program objectives, such as smoking cessation, where others are comprehensive and encompass a wide-range of topics with allocated resources and personel.[36] Despite lack of standardization, there are however checklists from HERO, the American Heart Association, and the Wellness Council of America that provide suggestions for WWP offerings.

The most common type of workplace wellness offering is an HRA, which is a survey that gathers baseline self-report data from employees so employers can create specific subsequent lifestyle management interventions.[32] The most common lifestyle management interventions include nutrition and weight management, smoking cessation, fitness, alcohol/drug abuse, stress management, financial-wellbeing and general health education.[35] Other types of interventions WWPs offer include providing self-help education materials, individual counseling with health care professionals, or on-site activities led by trained personnel.[32]

Although WWPs are perceived as effective, causal inference is lacking in this body of literature because much of the prior research has been observational with selection bias noted. When studying the effectiveness of WWPs, medical-spending and absenteeism are often the primary outcomes. The most commonly cited meta-analyses in the WWP literature was conducted by Baicker et al in 2010 and reviewed 22 intervention studies, which identified for every $1.00 spent on WWPs, about $3.27 are saved from medical costs.[32] This statistic is historically referenced in the promotion of the development of WWPs. Yet, all but two prior WWP studies, which will be discussed, tested the efficacy of pre-existing programs within the WWP (e.g. WWP physical activity or nutrition interventions) rather than the WWP itself.

One of the two randomized controlled trials (RCT) on a comprehensive WWP was conducted at the University of Illinois Champaign-Urbana (UIUC), and contradicted the findings from the Baicker study.[37] This RCT designed and implemented a comprehensive WWP at UIUC at the individual level. Participants were randomized into the control group, which had minimal contact with study investigators and did not participate in the WWP, or the treatment group, which provided financial incentives to complete wellness programming activities. Investigators used a combination of self-reported survey and administrative data to estimate the effect of financial incentives on participation in a WWP as well as the causal effects of WWP on medical spending, employee productivity, health behaviors, and well-being after one year. Results from this large-scale RCT found no significant causal effect of WWPs on medical expenditures, health behaviors, employee productivity, or self-reported health status in the first-year post-intervention. Using 99% confidence intervals, this study contradicted 83 percent of the findings reported in 115 prior studies, including the popular return on investment analyses by Baicker et al. When the UIUC WWP investigators analyzed the data as though it were observational using an ordinary least squares regression, the results were significant and in line with prior observational studies. The UIUC WWP study highlights the importance of randomized controlled study design in determining the effectiveness of WWPs and reducing selection bias.

The findings from the other RCT, that was conducted at 160 BJ's Wholesale Club worksites over 18 months were consistent with the UIUC findings. Implemented at the worksite level, 20 worksites were randomly selected to receive the wellness program intervention and 140 worksites were control worksites that received no wellness programming.[38] The wellness program intervention comprised eight modules that focused on nutrition, PA, stress reduction, chronic disease prevention and other wellness topics that were implemented by a registered dietitian nutritionist at the treatment worksites. Data were collected using self-reported health risk assessments, biometric screens, medical spending, and employment outcomes. The findings suggest about one third of individuals had completed at least one module of the

intervention and one fifth completed at least 3 modules. The WWP had no effect on clinical measures of health, healthcare spending or utilization, or employment outcomes after 18 months but did find participants in the treatment groups reported better health behaviors, including regular exercise and weight management. As demonstrated from the UIUC and BJ's Wholesale Club WWP studies, further experimental data with long-term follow up is needed to estimate reliable effects of WWPs on many outcomes.

Theory and Conceptual Framework

The primary theory applied in this thesis was the Self-Determination Theory (SDT), which suggests an individual's behavior is self-motivated and self-determined based on the satisfaction of three psychological needs: autonomy, competence, and relatedness.[39] This theory has been used primarily in a clinical setting but can be applied to PA. Autonomy is the urge to self-govern and have a sense of volition in their actions. An example of autonomy in PA would be choosing to participate in a certain activity. Competence is the ability to experience mastery. For example, someone would satisfy their need for competence by obtaining new skills from an activity. Relatedness is the need to connect and interact with others. Relatedness in PA could be seen in those who engage in PA to be spend time with friends. [40,41] A large systematic review that included 66 empirical studies, identified a positive relationship between satisfaction of basic needs and higher engagement in PA and overall PA.[42] Much of the research using SDT to explore PA outcomes has been conducted in healthy individuals, similar to the WWP population being sampled in this thesis.

To gain a sense of competence and relatedness, the individual must first satisfy their need for autonomy as this will improve their willingness to act and learn new skills then feel more connected to the WWP. One approach to provide autonomy-supportive environments in the workplace is to have a non-controlling environment.[43] In a WWP, the practitioners should provide autonomy-supportive PA counseling as a means to improve individual perceived competence in the PA in which they participate.[44]

Autonomy-supportive PA counseling helps the client understand how their decisions and values may impact their PA outcomes and aids the client to make a sound and rational decision.[45] When an individual perceives their practitioner as autonomy-supporting, they have higher levels of perceived autonomy, competence, and relatedness, which raises the motivation to engage in PA.[46] Perhaps when wellness practitioners use autonomy supportive coaching/counseling, participants will experience elevated levels of motivation.

To support satisfaction of competence in a WWP environment, a well-structured and non-chaotic environment should be created because individuals are more comfortable doing an activity when they have a greater educational foundation.[43] Through working with a WWP practitioner, this may deepen the individual's understanding of how to complete the PA of interest. Once an individual has initiated engagement in PA, higher levels of competence have been found to be a large motivator to remain physically active.[47] In addition to motivation, higher competence in employees can improve attitudes surrounding PA and increase the minutes of LTPA they participate in.[48]

In addition to feeling autonomous and competent, employees must also perceive their WWP as a warm and responsive environment, which will best support the satisfaction of relatedness.[43] There is a gap in the literature about how satisfaction of relatedness impacts PA and much of the research has been conducted in the workplace rather than the PA environment. Potentially findings from the work environment could be applied to the PA environment in a WWP. Employees who had low perceived levels of relatedness to their workplace attributed this to an unconducive work environment.[48] This is important for supervisors to understand as a lack of perceived relatedness may affect the employees ability to complete necessary work or obtain the motivation to be physically active.

The secondary theory that framed this thesis was the Transtheoretical Model (TTM), which suggests that readiness for change underlies the decision to engage in and maintain a health-promoting

behavior, such that individuals have the potential to progress and regress throughout stages of readiness towards change.[49] According to the TTM, PA maintenance is considered achieved if an individual has continued engagement for more than 6 months.[49] A large meta-analysis, with a total sample of 68,580, that used the TTM definition of maintenance identified that 36 percent of participants had maintained PA recommendations after 6 months.[50] This thesis used this definition for PA maintenance when the data were analyzed longitudinally.

WWPs and health care practitioners need to adapt practices to support the satisfaction of their clients' psychological needs for autonomy, competence and relatedness. Overall, the evidence suggests satisfaction of all three psychological needs is the best predictor of PA maintenance.[39] Current gaps in the literature include assessing domains of PA in participants and non-participants of WWP and how satisfaction of the psychological needs influences the motivation to be physically active across domains of PA.

Thesis Objectives

This study focused on one comprehensive University Wellness Program (UWP) at a large, academic institution in upstate New York. This UWP served all staff, faculty, retirees, and their spouses/partners in the areas of fitness, nutrition, and well-being. As a comprehensive UWP, they provided individual wellness consultations in the areas of fitness, nutrition, and life coaching; department specific workshops and support for supervisors and employees to promote well-being within work units; group fitness classes; and many educational opportunities via programming and lecturing. Statistics for this UWP from the 2016 fiscal year show there were 4,662 members, which is approximately 47% of all employees at the university. The membership is 66% staff, 18% faculty, 6% retiree, 5% spouse/partner, and 5% unionized employee. Half of the wellness members joined through their insurance plan, which covers the cost of UWP membership (approximately $175 per year). Based on the demographics of this

UWP, it is representative of the larger University community; members are predominately white, female, staff in the exempt employment category.

Using the SDT as the theoretical framework, this thesis will address the stated gaps in the literature by answering the following research questions and subsequent objectives:

1. How do workplace wellness physical activity program (WWPAP) participants and non-participants differ with regard to PA and motivations?
    a. Describe the domains of PA in WWPAP participants and non-participants.
    b. Describe the perceived psychological need for autonomy, competence, and relatedness in regard to PA in WWPAP participants and non-participants.
    c. Contrast need for autonomy, competence, and relatedness across domains of PA in WWPAP participants and non-participants.
2. Are motivational needs satisfied in follow-up WWPAP participants?
    a. Contrast psychological need for, and subsequent satisfaction of, autonomy, competence, and relatedness in follow-up WWPAP participants.

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PARTICIANTS IN A WORKPLACE WELLNESS PHYSICAL ACTIVITY PROGRAM ENGAGE IN LESS TOTAL PHYSICAL ACTIVITY THAN NON-PARTICIPANTS AND HAVE HIGHER MOTIVATIONAL NEEDS

PURPOSE

The Centers for Disease Control and Prevention (CDC) reported, using the Behavioral Risk Factor Surveillance System survey, that physical activity (PA) declined significantly over the past 30 years: four out of five Americans were not meeting the total PA recommendations in 2013.[8,51] On the other hand, a large, multi-country, validation study assessed total PA using the International Physical Activity Questionnaire (IPAQ) and reported that 89% of American adults met the recommendations for total PA in 2013. This contradiction warrants further investigation into rates of total PA, which were assessed in this study. Low engagement in PA is problematic because it is one modifiable risk factor associated with improved mental health and reduced likelihood of developing a chronic disease, projected to account for almost three quarters of all deaths worldwide in 2020.[3,4]

PA can be classified by four domains: utilitarian, activity specific to chores and daily life; transportation, activity spent commuting; occupational, activity specific to work; and leisure-time, moderate or vigorous activity outside of daily life. Data from large, nationally representative samples show that socioeconomic status (SES) and type of PA are associated. Individuals who have higher paying jobs and higher education more often hold sedentary, desk jobs, which often results in lower rates of occupational PA and higher rates of LTPA.[25] By contrast, lower SES employees who hold hourly, goods-producing jobs, commonly have higher rates of occupational PA and lower rates of LTPA.[10,14] Employees with higher SES may have more flexibility both within and outside of business hours, which allows more opportunities for LTPA and presumably additional access to recreational facilities to allow safe engagement in PA.[25,26] Further research is needed to understand differences in PA by domain, SES, and occupation to better inform the development of programs and interventions to promote PA.

Furthermore, motivations may be associated with both frequency and domain of PA performed. The Self-Determination Theory (SDT), posits an individual's behavior is self-motivated based on the satisfaction of three psychological needs: autonomy, one's urge to self-govern; competence, one's ability to experience mastery; and relatedness, one's need to connect and interact with others.[39] A recent systematic review of 66 primarily observational studies found that higher satisfaction of psychological needs was positively associated with higher PA relative to those with lower satisfaction of needs.[42]

This study focuses on participants and non-participants in a workplace wellness physical activity program (WWPAP). The wellness program sampled from has a comprehensive list of offerings outside of PA such as participation in a cooking class, meeting with a registered dietitian nutritionist, classes regarding management of chronic disease and financial wellbeing workshops. Although employees could have participated in any aspect of the workplace wellness program, this study specifically recruited people who were and were not current participants in the WWPAP.

This study had two aims: 1) To investigate the differences between WWPAP participants and non-participants by describing the domains of PA, perceived psychological need for autonomy, competence, and relatedness in regard to PA, and contrast of need for autonomy, competence, and relatedness across domains of PA; and 2) to understand whether motivational needs are met and PA is maintained among WWPAP participants by contrasting need for, and subsequent satisfaction of, motivations among follow-up WWPAP participants.

METHODS

DESIGN

This study used a cross-sectional design to compare WWPAP participants (2017) to non-participants (2018) and follow-up WWPAP participant (2018) to non-participants (2018), and a longitudinal design that compared the same WWPAP participants in 2017 to themselves 12 months later.

SAMPLE

The study population consisted of employees from a large academic institution in upstate New York. There were three distinct samples within the study population. First, employees who participated in the WWPAP were recruited in the fall of 2017; herein referred to as the "all WWPAP participants" sample. Information regarding the study was distributed electronically via the university's workplace wellness program email-listserv, which included a summary of the research and electronic consent. Inclusion criterion required participants to be ages 18 years or older and university faculty, staff, retiree, or a spouse/partner of an employee, and a current participant in the WWPAP with access to technology to complete online surveys. Participants were excluded from the study if they were unable to read English or were not active participants in the WWPAP.

Second, members of the all WWPAP participant sample who responded to the follow-up survey in the fall of 2018 were referred to as the "follow-up WWPAP participants" sample. After the all WWPAP participant sample completed a survey in 2017, those who provided email addresses received information regarding the follow up study, which included a summary of the research and electronic consent.

Third, employees who worked for the university's dining and facilities departments who reported they did not participate in the WWPAP were recruited in the fall of 2018; herein referred to as the "non-participants" sample. This sample was recruited using email-listservs and in-person recruiting, through the form of a 3-minute presentation at department wide meetings. Demographic data from the WWPAP suggest these departments are the most underrepresented in the WWPAP, which was motivation to capture this group as a comparison to WWPAP participants. Eligibility criterion for the non-participants sample included participants who were ages 18 or older, employees of the university, did not participate in the WWPAP, and had access to technology to complete surveys. Exclusion criteria included the

inability to read English. It should be noted that nine employees from the non-participant sample reported having a wellness membership and used the WWPAP and therefore were removed from analysis.

MEASURES

For all study measures, data were collected using the online survey platform Qualtrics. All participants completed one, 15-minute online survey that consisted of four parts. Table 1 depicts the measures each sample completed with the 'X' marking. The measures are explained in detail below.

Table 1. Study Measures by Sample

	All WWPAP Participants (2017)	Follow-Up WWPAP Participants (2018)	Non-Participants (2018)
Primary PA	**X**		
Maintenance of Primary PA		**X**	
Total PA		**X**	**X**
Motivation for PA	**X**		**X**
Satisfaction of Motivation for PA		**X**	
Socio-demographic Characteristics	**X**		**X**

Primary physical activity. In 2017, primary LTPA was assessed based on self-reported primary LTPA and the frequency of performing that activity. Primary LTPA was defined as the activity the participant self-reported they primarily engage in ("Which do you consider your primary physical activity?"). Participants selected an activity from a list of 37 physical activities (15 individual and 22 group fitness activities). Activities were classified as being group or individual PA based on whether or not the activity was a group fitness class that was offered by the WWPAP or not. Frequency of participation in primary LTPA was measured by the number of self-reported hours they performed their primary PA in a typical week (1 through 9 or $\geq$10 hours each week).

Maintenance of primary physical activity. In 2018, follow-up WWPAP participants were asked whether or not their primary LTPA was the same as 12 months prior; and whether or not the frequency of this activity was also the same as 12 months prior. The same 22 group fitness from activities from baseline were offered by the WWPAP and all individual activities were still accessible to follow-up WWPAP participants.

Total physical activity. Total PA, and PA by domain and intensity, were assessed using the long-form International Physical Activity Questionnaire (IPAQ)[52], which is a reliable and validated tool in 12 countries. IPAQ is validated for adults ages 18-65 years and consists of 27 questions that assess the amount of time an individual engages in each of the four domains of PA: household and yard work (utilitarian), occupational, transportation, and LTPA in addition to time spent sitting. All questions prompt the participant to refer to the previous 7 days ask them to report the number of days, and the amount of time in hours and minutes that they engage in different types of activities. Hours and minutes are then converted into minutes for analysis. Per IPAQ scoring protocol, activities lasting fewer than 10 minutes were excluded from my analysis. For each question, a score was generated for walking, moderate, and vigorous- intensity activities, which allowed computation of PA domain-specific scores by intensity. All results from IPAQ were presented as metabolic equivalent-minutes (MET-minutes), an estimation of energy expenditure. Per IPAQ scoring protocol, MET-minutes were calculated by multiplying the MET value of each activity (walking = 3.3; moderate intensity = 4.0; and vigorous intensity = 8.0) by the number of minutes spent in that particular activity by the number of days engaged in that activity (e.g., walking MET-minutes/week at work = 3.3 x walking minutes x walking days at work). Total PA was computed by summing the outputs of all MET-minutes engaged in utilitarian, occupational, transportation, and LTPA. Missing data were managed according to the IPAQ coding protocol.[53] The IPAQ total score can be categorized as an index of inactivity (<600 MET-minutes/week) or minimal/high activity ($\geq$ 600 MET-minutes/week).

Motivation for physical activity. Psychological needs were measured by the Revised Motivation for Physical Activity Measure (MPAM-R)[54], which is a 30-statement, validated tool used to assess motivation to participate in PA. Responses to each item were recorded on a 7-point Likert scale ranging from 1 (not at all true for me) to 7 (very true for me). The questionnaire contains five subscales of psychological need, which were assigned to each construct of SDT: autonomy was the mean of all interest/enjoyment (e.g., "I enjoy this activity") and fitness (e.g., "I want to maintain my physical strength") subscale items; competence was the mean of competence (e.g., "I like physical challenges") items, and relatedness was the mean of all social (e.g., "I want to meet new people") and appearance (e.g., "I want to improve my appearance") subscale items. Respondents missing more than half of sub-scale items were coded as missing the relevant sub-scale. Higher mean subscale scores for each construct of SDT indicated higher levels of autonomy, competence, and relatedness.

In 2018, the MPAM-R was further adapted to reflect psychological satisfaction by changing each statement to the past tense to measure if a participant had fulfilled his or her needs through participation in PA. An example of the adapted statements for competence changed the statement from "I like physical challenges" to "I have been physically challenged." Satisfaction of autonomy, competence, and relatedness were the mean of sub-scale items described above. Higher mean subscale scores indicated higher levels of autonomy, competence, and relatedness.

Socio-demographic characteristics. There were 12 questions assessing participant demographics. First, participants reported their age in years. Then, they selected their sex: 'male', 'female', or 'other.' In assessing race and ethnicity, participants selected one item from a list that included 'American Indian', 'Alaska Native', 'Asian', 'Black/African American', 'Hispanic/Latino', 'Native Hawaiian/Other Native Pacific Islander', 'White', or 'Other.' The highest level of education was determined based on participant selection from a comprehensive list ranging from 'No schooling completed' to 'Doctorate degree.' Marital status was reported by selecting from the following list: 'Single, never married', 'Married or

domestic partnership', 'Widowed', 'Divorced', or 'Separated.' If respondents reported 'Married or domestic partnership' they were deemed married where all other responses were categorized as not married. Lastly, participants were asked to select if they were employed by the university as faculty, non-faculty academic, or staff. Faculty and non-faculty academic were grouped together for analysis.

ANALYSIS:

Sample characteristics were summarized by means, and percentages. Chi-square analysis assessed the representativeness of the follow-up WWPAP among all WWPAP by contrasting WWPAP follow-up respondents and non-respondents.

Measures of motivation and PA were assessed for normality. The motivation data were normally distributed, but the PA data were not. Therefore, more conservative, non-parametric testing was conducted on all data from the IPAQ and parametric testing was conducted on all data from the MPAM-R. Median MET-minutes were calculated to summarize levels of PA by domain and intensity and were compared to follow-up WWPAP participants and non-participants using Mann-Whitney tests.

Correlations between MET-minutes, by domain and intensity, and need for autonomy, competence, and relatedness were tested using Spearman's rank correlations, in WWPAP participants and non-participant samples separately. For all correlations, the Evans suggestion for the absolute value of r were used (.20-.39 = weak; .40-.59 = moderate; .60-.79 = strong; .80-1.0 = very strong)[55] to describe associations. Among WWPAP participants, need for autonomy, competence, and relatedness in 2017 was compared to satisfaction of autonomy, competence, and relatedness in 2018 using paired t-tests.

All research activities involving human subjects were reviewed and exempted by the Cornell University Institutional Review Board on the use of Human Subjects in research (protocol ID #1709007458). All analyses were performed with the use of R Studio, version 1.1.456 and SPSS, version 25. This study considered P values of less than 0.05 indicative of statistical significance.

RESULTS

The analysis included 192 respondents to the WWPAP participant survey and 49 respondents to the non-participant survey. Overall, WWPAP participants and non-participants had a mean age of 45 years (Table 2). As compared to non-participants, WWPAP participants included more women (76% vs. 59%, p-value <0.001), more often had a college degree (89% vs. 10%, p-value <0.001), were proportionately more white (92% vs. 88%, p-value 0.005), more were married (72% vs. 53% p-value <0.001), and more were employed in faculty or academic positions (28% vs. 23% p-value <0.001). It should be noted that almost one-third of the non-participant sample had wellness memberships but did not participate in PAs through the program.

Among WWPAP participants, those who responded to the follow-up survey (n=53) were not significantly different on all measured characteristics to those who did not (n=139; data not shown). Therefore, comparisons between WWPAP participants and non-participants examined all WWPAP participants whenever possible.

Table 2. Sample Characteristics

	All WWPAP Participants (2017)			Non-Participants (2018)			
	n	**Count**	**%**	**n**	**Count**	**%**	**P-values**
Sex	192			49			**<0.001**
Male		46	24		19	39	
Female		146	76		29	59	
Other		0	0		1	2	
Education	192			44			**<0.001**
High School Degree		2	1		22	50	
Some College Credit, No Degree		7	4		13	30	
Associates Degree		13	7		4	9	
Bachelor's Degree		57	30		4	9	
Master's Degree		65	34		1	2	
Professional Degree		9	5		0	0	
Doctorate Degree		39	20		0	0	
Race/Ethnicity	192			47			**0.005**
White		177	92		42	89	
Hispanic/Latino		7	4		1	2	
Asian		5	3		3	6	
Black/African American		3	2		1	2	
Married	192			49			**<0.001**
Yes		138	72		26	53	
No		54	28		23	47	
Type of Employee/Retiree	181			48			**<0.001**
Faculty/Academic		51	28		11	23	
Staff		130	72		37	77	
Age	187			37			0.386
20-29		23	12		9	24	
30-39		50	27		10	27	
40-49		44	24		6	16	
50-59		39	21		10	27	
60-69		22	12		2	5	
70+		9	5		0	0	
Wellness Membership		192	100		27	32	

Chi-square analysis

Differences Between WWPAP Participants and Non-Participants

When the percentage of the WWPAP participants and non-participants who met the PA Guidelines for Americans was assessed, 82% of non-participants and 98% of participants met the recommendation to engage in 150-minutes of moderate to vigorous intensity PA every week. Non-participants engaged in significantly more total PA than follow-up WWPAP participants (p-value <0.001, Table 3). However, between follow-up WWPAP participants and non-participants, PA differed for all but two domains and intensities: utilitarian and transportation PA. WWPAP participants reported more LTPA whereas non-participants reported more occupational PA. 76% of WWPAP participants and 49% of non-participants met the PA recommendations through LTPA alone. Non-participants also reported the engaged in more absolute PA in each intensity category. However, the proportion of time spent within each intensity suggests that follow-up WWPAP participants spend a higher proportion of time in moderate (50% vs. 44%) and vigorous (26% vs. 17%) intensity PA. The biggest differences between PA medians occurred with occupational PA (12% vs. 82%) and LTPA (39% vs. 4%). When correlations between domain and intensity were examined, domain and intensity were highly correlated (significant in 6 out of 12 correlations for follow-up WWPAP participants and 10 out of 12 correlations for non-participants -- data not shown). Therefore, the remainder of the results will include only domains of PA and not intensity.

Table 3. Median MET Minutes by Domain and Intensity of PA for WWPAP Participants and Non-Participants

	Follow-Up WWPAP Participants (2018) (n=53)		Non-Participants (2018) (n=49)			
	Median	**IQR 25-75%**	**Median**	**IQR 25-75%**	**Difference between medians**	**Mann-Whitney P-value**
Total PA	4,311	2,710-7,543	17,700	3,222-31,947	-13,389	**<0.001**
By Domain						
Utilitarian	1,340	368-3,225	1,700	0-5,175	-360	0.166
Occupational	462	0-1,372	11,160	0-19,487	-10,698	**<0.001**
Transportation	495	33-941	165	0-1,733	330	0.645
Leisure-time	1,440	598-2,316	594	0-2,091	846	**0.018**
By Intensity						
Walking	1,089	594-1,716	5,148	165-8,762	-4,059	**<0.001**
Moderate	2,295	643-3,830	5,770	1,020-9,540	-3,475	**<0.001**
Vigorous	1,200	160-2,400	2,272	0-7,560	-1,072	**0.043**

Mann-Whitney Test

Greater need for autonomy and competence were associated with WWPAP, but relatedness was not (Table 4). The sample of all WWPAP participants reported a higher need for autonomy (mean 5.73 vs. 4.68 p-value <0.001) and competence (mean 5.08 vs. 4.19 p-value 0.005) than non-participants, and the two groups had equivalent need for relatedness. A sensitivity analysis that included only the 53 follow-up WWPAP survey respondents showed similar findings in that follow-up WWPAP participants had a higher need for autonomy (mean 5.63 vs. 4.68 p-value 0.001) and competence (mean 5.02 vs. 4.19 p-value 0.018) and equivalent need for relatedness as non-participants. Need for autonomy, competence, and relatedness were all positively correlated with one another among both WWPAP participants and non-participants (p-value <0.001 for all measures).

Table 4. Comparison of Psychological Needs Among All WWPAP Participants and Non-Participants

Overall Need for:	All WWPAP Participants			Non-Participants			Difference	P-value
	n	**Mean**	**SD**	**n**	**Mean**	**SD**		
Autonomy	111	5.73	1.01	37	4.68	1.45	1.05	**<0.001**
Competence	103	5.08	1.42	36	4.19	1.63	0.89	**0.005**
Relatedness	101	4.52	1.25	36	4.25	1.59	0.27	0.355

Independent samples t-tests

Correlations between need for autonomy, competence, and relatedness and domain of PA among WWPAP participants and non-participants were observed (Table 5). Among follow-up WWPAP participants, there were weak positive correlations between need for autonomy and utilitarian and occupational PA; in addition to need for competence and utilitarian and occupational PA. The weak positive correlation between need for autonomy and occupational PA was statistically significant (p-value 0.025). Among non-participants, need for autonomy was weakly positively associated with total PA and moderately positively correlated with LTPA (p-value 0.002). Needs for competence and relatedness were both moderately positively correlated and statistically significant with LTPA (p-values 0.004 and 0.008). In non-participants, need for relatedness was weakly negatively associated with transportation PA. The highest correlations were observed between need for autonomy, competence, and relatedness and leisure-time PA in non-participants.

Table 5. Correlation between Need for Autonomy, Competence, and Relatedness with MET Minutes across Domains of PA among Follow-Up WWPAP Participants and Non- Participants

	Follow-up WWPAP Participants			**Non- Participants**		
	Autonomy (n=40-47)	**Competence (n=39-46)**	**Relatedness (n=35-42)**	**Autonomy (n=30-37)**	**Competence (n=29-36)**	**Relatedness (n=29-36)**
Total PA	0.179	0.160	0.114	0.219	0.148	0.041
By Domain						
Utilitarian	0.231	0.207	-0.038	0.136	0.156	0.111
Occupational	**0.326***	0.235	0.126	0.108	0.179	0.028
Transportation	-0.092	-0.137	0.020	-0.076	-0.058	-0.328
Leisure-time	-0.17	-0.043	-0.090	**0.533** (.002)**	**0.512** (0.004)**	**0.474** (.008)**

Spearman's rank correlation coefficient
Asterisks mark statistically significant correlations: *P<0.05 and **P<0.01

Satisfaction of Needs and Maintenance of Physical Activity Among Follow-Up Wellness Participants

In 2017, 76% of WWPAP participants engaged in an individual primary PA at baseline and 24% primarily engaged in group PA (Table 6). Maintenance of these primary physical activities and frequency of engagement in primary PAs was low: 14 individuals (26% of wellness follow up sample) reported engagement in the same primary PA as at baseline, and 16 individuals (30%) reported engagement in the primary PA, although it did not need to be the same primary PA as baseline, for the same amount of time as at baseline (data not shown). Follow-up WWPAP participants reported having higher need for autonomy than they were able to satisfy (5.7 vs. 5.1, p=0.007; Table 7). Their needs for competence and relatedness were equivalent to satisfaction of those needs.

Table 6. All WWPAP Participants Primary PA and Frequency of Primary PA

Primary PA			
Group Activity		145	76
Individual Activity		47	24
Hours doing Primary PA each week (n=204)			
<1 Hour		22	11
2 – 3 Hours		97	48
4 – 5 Hours		48	24
6 – 7 Hours		14	7
8 - 9 Hours		9	4
> 10 Hours		14	7

Table 7. Contrast of Psychological Needs and Psychological Satisfactions Among Follow-Up WWPAP Participants

Type of Motivation	**Need**			**Satisfaction**			**Difference**	**P-value**
	n	**Mean**	**SD**	**n**	**Mean**	**SD**		
Autonomy	43	5.59	1.14	43	5.06	1.34	0.53	**0.046**
Competence	41	4.91	1.51	41	4.66	1.23	0.25	0.373
Relatedness	38	4.53	1.35	38	3.86	1.44	0.67	0.051

Paired t-test

DISCUSSION

HOW DO WWPAP PARTICIPANTS DIFFER FROM NON-PARTICIPANTS?

WWPAP participants and non-participants differed from one another regarding socio-demographic characteristics; total PA, as well as the domains of PA; and need for autonomy and competence but not relatedness. Many of these differences are consistent with the existing literature[13], and each will be discussed in detail below.

As compared to non-participants, the WWPAP participants were of higher SES and were predominately white, married females, with a college degree, and employed in faculty or academic positions. These observational data are mostly consistent with the noted selection bias present in the majority of this body of literature, which was controlled for in the University of Illinois Workplace Wellness Program study. Those investigators identified the employees who voluntarily participated in the workplace wellness program were younger, white, females, with a median annual income of $62,000, employed in administrative staff positions and had lower than average medical spending and higher than average PA. [37]

In this study, non-participants also may be a biased sample. The non-participant sample was predominately white, married, females with a high school degree, and employed in staff positions. To recruit non-participants, I purposively selected departments -dining and facilities - that historically have low-participation rates in the WWPAP. This is consistent with the literature that suggests non-wellness program participants have lower education and reside in lower-income ZIP codes.[35] The differences in sample characteristics between WWPAP participants and non-participants were associated with different PA and motivational needs.

According to the PA Guidelines for Americans, the recommendation for total PA is $\geq$ 600 MET-minutes per week. 82% of non-participants and 98% of WWPAP participants met this recommendation,

which is consistent with expected results from IPAQ. The IPAQ validation study of primarily middle-aged, full-time employed, men and women, with mostly good health, from 12 countries suggested that 89% of respondents met the PA recommendations.[52] Therefore, non-participants were slightly less likely to meet recommendations than might be expected, and the WWPAP participant sample was slightly more likely to meet recommendations. Data from this study suggest 49% of non-participants and 76% of WWPAP participants met the PA recommendation through LTPA alone, which is higher than the 25% of men and 18% of women meeting the recommendation with only LTPA as reported by the CDC in 2013.[51] Potential reasons why LTPA differed greatly between WWPAP participants and non-participants include: 1) faculty jobs held primarily by WWPAP participants, are often salaried positions that provide flexibility both within and outside of business hours for LTPA[4] and; 2.) WWPAP participants have higher education, which may have been associated with better access to recreation and leisure-time resources/facilities[25,26] and; 3.) non-participants are getting sufficient amounts of PA through their occupations and do not seek out LTPA.

The difference between LTPA between WWPAP participants and non-participants is concerning because of associated outcomes related to both physical and mental health. A large meta-analysis that assessed the mental health benefits of domain-specific PA found a positive association between LTPA and improved mental health where occupational PA was positively associated with mental ill-health.[22] The effect of domain specific PAs on all-cause mortality were assessed in a highly powered systematic review of 80 studies identified a decreasing risk of all-cause mortality by 26% in LTPA and 17% in occupational. This prior research suggests that WWPAP management should actively recruit and retain non-participants because of the significant physical and mental health benefits.

As compared to non-participants, WWPAP participants had higher needs for autonomy and competence but equivalent need for relatedness. This is supported by prior research that suggests people who engage in organized PA, such as those available through a WWPAP, demonstrate higher levels of

competence than those who engage in non-organized PA.[56] This is partly because they may have more people with whom to compare their skills, which may improve their perceptions of themselves.[57] Prior research in a large employer in New York State has demonstrated a positive association between higher SES and higher need for psychological motivations, particularly autonomy, which is strongly associated with physical and mental health.[58] Therefore, the previously discussed differences in sample characteristics, particularly education, may be contributing to the differences in the needs for autonomy and competence which influences participation in the WWPAP.

Motivational needs were correlated with LTPA in non-participants such that greater need was associated with greater MET-minutes of LTPA. This study confirms prior research that demonstrated need for autonomy, competence, and relatedness are associated with higher LTPA for non-participants but not WWPAP participants.[42] The differences in motivational needs observed between all WWPAP participants and non-participants may contribute to the differences observed in participation. Perhaps non-participants engaged in less LTPA than the 53 follow-up WWPAP participants because their needs for autonomy and competence were lower than WWPAP participants, which is correlated with lower LTPA.

HOW ARE MOTIVATIONAL NEEDS MET AND PA MAINTAINED IN PARTICIPANTS?

Maintenance of PA was relatively low among WWPAP participants. However, I used a narrow definition of maintenance, specifically the participant's primary LTPA and frequency of primary LTPA at 12 months follow-up. This was a limitation because I was unable to describe the WWPAP participant's total PA pattern at time 1. For example, the participant could have reported running as their primary LTPA, which they may have engaged in 3 times per week for a frequency of three hours without reporting any other LTPA. Findings from this study suggest that 26% of the sample had engaged in the same primary LTPA and 30% were engaged in that primary LTPA for the same amount of time as at time 1. When I compared these findings to a large meta-analysis that assessed maintenance of LTPA recommendations with a total sample of 68,580 people with similar characteristics to the WWPAP

participant sample, 36% of participants had maintained the PA recommendations after 6 months.[50] Therefore, a 10% difference in findings suggests they are relatively similar and it might be expected that if the measurements from the meta-analysis were at 12 months instead of 6 months findings from this study might be more comparable.

Although I am unable to identify the reasons why WWPAP participants had low PA maintenance, one reason may be because their needs for autonomy were not satisfied. Feeling autonomous regarding WWPAP might include having a sense of choice in the type of PA in which to participate. Possibly wellness practitioners need to engage in autonomy-supportive coaching/counseling to elevate levels of satisfaction in participants.[59]

Another area of potential improvement for the WWPAP to promote satisfaction of psychological needs for their participants could be to alter the types of PA offered in the WWPAP. The wellness program from which I sampled has over 100 group fitness classes each week but has been offering the same classes with same instructors for years, which may reduce autonomy in the WWPAP. To improve participation in the WWPAP, additional choice and variety should be incorporated into the group fitness offerings. Together, the low satisfaction of autonomy and low maintenance of primary PA and should be explored in future research.

Furthermore, I was unable to measure the satisfaction of psychological needs in non-participants. This should be an area of future research so comparisons of psychological needs and satisfactions can be made among employees who do and do not participate in a WWPAP. Perhaps non-participants are satisfying their needs through means other than participation in the WWPAP.

LIMITATIONS

Limitations to specific findings have already been discussed but additional factors should be considered in the interpretation of these findings.

WWPAP participants were sampled at two sequential time points 12 months apart, and there was significant dropout which resulted in a 27% response rate at follow-up. I actively tried to maximize response to follow-up by emailing the all-WWPAP participant sample twice to participate in the follow up study and offered financial compensation for survey completion. The low sample size of follow-up WWPAP participants possibly affected the findings by favoring the null due to inadequate power. However, sensitivity analyses conducted with and without the follow-up WWPAP participants present in the all-WWPAP participant sample suggested minimal effect. There could have been selection bias in those who chose to respond to the follow-up survey as I would expect those who responded would be more active and interested in completing a survey.

All data were self-reported, which can be compromised by social desirability bias and can lead people to choose response options which they think are 'correct' or socially approved. The IPAQ survey required participants to refer to the previous 7 days and report the number of days and amount of time they engaged in PAs from the four domains. Relying on self-reported data may have introduced recall-bias although IPAQ is a highly validated and used survey. Because PA is considered a more socially desirable trait, if bias had been present, the bias would be away from the null and could potentially affect all types of PA. Much of the IPAQ data had outliers for both WWPAP participants and non-participants. To minimize this potential limitation, sensitivity analyses were conducted with and without outliers, and non-parametric testing was conducted so the outliers wouldn't bias the results. Had I not accounted for outliers, the results may have overestimated the number of MET-minutes engaged in PA. Motivation data

also may be biased because they were based on Likert-type scales in which respondents may avoid choosing ‘extreme’ options, thereby limiting their variability.

SIGNIFICANCE:

This paper confirms evidence that employees who voluntarily participate in the WWPAP are of higher education and engage in more LTPA and less occupational PA than non-participants; the higher motivational needs for autonomy, competence, and relatedness are associated with LTPA among non-participants; and we would expect about a quarter of people to maintain their primary PA at 12 months. This study also provides new evidence that employees who do not participate in the WWPAP are significantly more physically active than WWPAP participants due to higher occupational PA. These findings could be partially explained by the differences in psychological needs for autonomy and competence such that WWPAP participants had a higher need for autonomy and competence than non-participants. Wellness participants’ need for autonomy was unsatisfied at one year. Future research should explore why motivational needs are left unsatisfied.

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CHAPTER 3
DISCUSSION AND CONCLUSIONS

This thesis investigated the differences between workplace wellness physical activity program (WWPAP) participants and non-participants, and how satisfaction of motivational needs relates to maintenance of physical activity (PA) in WWPAP participants. Many differences were observed between WWPAP participants and non-participants including sample characteristics; total, domain, and intensity of PA; and need for autonomy and competence. From these observations, I infer that education was related to PA, participation in a WWPAP, and motivational needs, although the direction of causation between SES, motivational needs, and PA remains unknown. Self-determination theory (SDT) suggests that satisfaction of the psychological needs for autonomy, competence, and relatedness motivates individual behaviors (e.g. participation in PA).[1] I observed low one-year maintenance of PA among WWPAP participants and need for autonomy that was not met, which provides some evidence in support of the SDT.

The results from this thesis formed three themes that warrant further discussion beyond the scope of Chapter 2: 1) how satisfaction of psychological needs may influence maintenance of PA, 2) how effective WWPAPs are at improving the health of employees, and 3) how workplace wellness programs may be widening disparities seen within health equity.

SATISFACTION OF PSYCHOLOGICAL NEEDS AND MAINTENANCE OF PHYSICAL ACTIVITY

The SDT, which guided this thesis, suggests an individual's behavior is self-motivated and self-determined based on the satisfaction of three psychological needs: autonomy, competence, and relatedness.[1] This theory was chosen because of its framework for studying human motivation and was used to understand, guide, and interpret all stages of this thesis. I also incorporated components of the Transtheoretical Model (TTM) to define the length of time for the follow-up of WWPAP participants who were assessed for maintenance of their primary LTPA and frequency of primary LTPA . Per the TTM,

PA maintenance is achieved if an individual continues participation for more than 6 months.[2] This thesis examined longer-term maintenance, by assessing primary LTPA at 12 months follow-up. By integrating SDT with TTM I began to understand how satisfaction of psychological needs was a potential motivator to maintain participation and frequency of primary PA.

Of 68,580 participants, from a meta-analysis consisting of 71 published reports that presented empirical data on at least one core construct of the TTM, 36 percent of participants maintained PA recommendations after 6 months.[3] In this thesis, the 53 follow-up WWPAP participants had somewhat lower maintenance at 12 months. 26 percent of the sample was not engaged in the same primary PA and 30 percent was not engaged in their primary PA for the same amount of time as at baseline. When I assessed satisfaction of psychological needs in the follow-up WWPAP participant sample, needs for competence and relatedness were equivalent to satisfaction but needs for autonomy were not met. This finding is consistent with a large systematic review of 66 empirical studies that measured SDT-based interventions aimed at increasing exercise behavior, which suggests that a lack of satisfaction in any or all of the psychological needs is correlated with lower motivation and less engagement in PA.[4]

The lower satisfaction of need for autonomy suggests that WWPAP participants had lesser abilities to self-govern or had a lesser sense of volition in their actions than they needed. This thesis was limited to studying behaviors and motivational needs pertaining to PA. Therefore, it is unknown if overall autonomy was satisfied or not, nor do we know what contributed to a lack of satisfaction of the motivational need for autonomy in regards to PA. Potential mechanisms include a controlling workplace or PA environment and inadequate autonomy-supportive counseling from wellness practitioners, which created an environment unsupportive of autonomy and did not elevate motivation to be physically active. Possibly there hasn't been sufficient choice and variety in the group fitness PA options at the WWPAP, which left WWPAP participants with a lack of PA choice and variety. Future research should investigate whether unmet need for autonomy is attributed to the structures of the WWPAP offerings or to PA itself.

For example, in the geographic location this thesis took place you cannot choose to run outside every day due to the weather, which could reduce autonomy for PA itself regardless of WWPAP offerings. If unmet need for autonomy is attributed to the structures of the WWPAP, organizational changes could be made to create successful interventions to improve employee health and engagement in LTPA.

A large limitation of this study was the inability to assess satisfaction of psychological needs in non-participants. This was due to the cross-sectional study design and lack of time to conduct a longitudinal study among non-participants. Had I been able to investigate satisfaction of motivational needs in non-participants, I could have better understood the role of the WWPAP in satisfying those needs. This is an area of future research worth investigating to make better comparisons among workplace wellness program participants and non-participants.

EFFECTIVENESS OF A WWPAP AT IMPROVING THE HEALTH OF EMPLOYEES

It could be argued that of the four domains of PA, a WWPAP has the greatest potential to improve PA through leisure-time PA (LTPA), thus increasing total PA. This was demonstrated in the findings because WWPAP participants engaged in almost three times the amount of LTPA as non-participants. Perhaps LTPA is more accessible to participants because a WWPAP membership at this university includes access to over 100 weekly group fitness classes, four campus gyms, two campus pools, tennis courts, squash courts, access to sporting equipment, and meetings with fitness professionals to develop individualized PA plans. The employees who did not participate in the WWPAP engaged in about five times more total MET-minutes of PA than WWPAP participants, despite significantly less LTPA. This is important to note because data from this study suggest 49% of non-participants and 76% of WWPAP participants met the PA recommendations through LTPA alone and 82% of non-participants and 98% of WWPAP participants met the PA recommendations through engagement in all four domains of PA. The benefits of any PA are well understood and include prevention of chronic disease, improved

mental health, improved physical function, enhanced self-perceived health, lower work absence due to illness, and higher work productivity among others.[5,6]

The difference in total PA was consistent with the literature[9] and was largely attributed to the significantly higher occupational PA reported by non-participants than participants. Although employee job title nor salary were asked, the non-participant sample was conveniently sampled based on WWPAP participation data that suggested the dining and facilities departments are the most underrepresented in the WWPAP. It is hypothesized that these departments have lower participation in the WWPAP because many of the employees hold unionized, hourly jobs, which means taking time to engage in LTPA at the WWPAP is time not getting paid at work. In addition, the findings of this thesis suggest the non-participants are significantly more physically active during working hours which may be one reason these employees are choosing not to participate in as much LTPA as WWPAP participants.[7]

This university's workplace wellness program actively targets employees of the university who are non-participants because University management perceives participation in a wellness program to be beneficial to the health and well-being of all employees.[8] This thesis only looked at one small component of the wellness program, which was the WWPAP. Focusing on PA allowed me to assess total and domains of PA among WWPAP participants and non-participants but limited my ability to assess differences between groups in other parts of the program, such as nutrition, that are intended to also contribute to health and wellbeing. Future research should consider how participation in different components of a workplace wellness program affects employee health and wellbeing.

There have been only two RCTs that designed comprehensive workplace wellness programs both of which largely produced null results. The first from the University of Illinois randomized employees into the control group and the treatment group, which provided financial incentives to complete wellness program activities. This study design allowed the investigators to test for selection bias by assessing the

characteristics of employees who voluntarily participated in the program as well as the causal effects of participation in the workplace wellness program on medical spending, employee productivity, health behaviors, and well-being after one year. The results from this large-scale RCT found no significant causal effects of participation in a workplace wellness program on medical expenditures, health behaviors, employee productivity, or self-reported health status in the first-year post-intervention.[9] The second study from BJ' Wholesale Club randomized worksites into the control and treatment group, which received a workplace wellness program consisting of 8 modules, delivered by a registered dietitian nutritionist. The results from this large-scale clustered RCT suggest a 36-45% participation rate at each worksite and that participants engaged in more regular exercise and were actively managing weight. This workplace wellness program had no statistically significant effect on self-reported health and behaviors (except for the two previously stated), clinical markers of health, medical spending and pharmaceutical utilization, or employment outcomes.[10] Findings from this thesis were consistent with their selection data in that the WWPAP participants were predominately white, married, females, college educated, and employed in faculty or academic positions. Comparisons to these studies can be made because the population of the University of Illinois study was similar to mine, being a university wellness program. Due to the limited scope and observational design of this thesis, I was unable to assess the effectiveness of the WWPAP at improving employee health. But my results question the effectiveness of the WWPAP because I did not observe primary PA maintenance in the majority of WWPAP participants and non-participants had higher total PA.

In conclusion, participation in this WWPAP may be associated with higher LTPA, but perhaps the WWPAP is only accessible to employees with higher education and who already engage in greater amounts of LTPA before WWPAP enrollment.

WORKPLACE WELLNESS PROGRAMS MAY BE DOING LITTLE TO ADDRESS HEALTH DISPARITIES

Workplace wellness programs are often funded and implemented by employers with the intent to improve employee health and wellbeing and to reduce health care spending.[11] These programs are considered a benefit to the employee and are often funded through human resources departments with the aim to reduce overall health care expenditures. The data are mixed regarding the efficacy of participation in a workplace wellness program on reducing medical spending. The most commonly cited meta-analysis in the workplace wellness literature, which reviewed 22 intervention studies, identified for every $1.00 spent on workplace wellness programs about $3.27 are saved from medical costs.[12] On the contrary, the only two RCTs in this literature, as previously described, found no causal effects of participation in the workplace wellness program on reducing medical spending at one year after controlling for selection bias.[9] Although medical spending was not an outcome measure of this thesis, these findings are consistent with the University of Illinois Workplace Wellness Program study in that the WWPAP had no significant association with overall PA participation and was an employee benefit used primarily by white-collar workers. This transfer of employer funds to white collar workers via wellness programs may potentially widen health disparities among university workers in low and high-wage positions.

At the university where this thesis was conducted, a small percentage of pay for benefits eligible employees contributes to funding the wellness program and its PA opportunities. In addition, WWPAP participants pay an additional $175 annually to receive access to the four fitness centers, two pools, group fitness classes, PA equipment and discounts at other university recreation facilities (ice skating, golf, sailing, etc.). Considering that employees who voluntarily choose to participate in the WWPAP were of higher education, one might infer the WWPAP functions similarly to a regressive tax system by utilizing company revenue and ‘giving’ it primarily to the white-collar workers. This does not entirely support the articulated aims of a workplace wellness program with the goal of promoting health and wellbeing in all

employees because a large subset of under-served employees who could greatly benefit are not able to use the services.

Furthermore, there have been domain-specific PA differences for both physical and mental health. Although these findings suggest that non-participants engaged in more total PA than the 53 follow-up WWPAP participants, this higher quantity of overall PA might not associate with better health by all outcomes. A large meta-analysis assessing the mental health benefits of PA by domain-specific PA had a combined sample size of 648,726 and found that LTPA and transportation PA were positively associated with improved mental health; whereas, occupational PA was inversely associated with mental health.[13] This is concerning because it may suggest that the non-participant sample (for whom most PA was occupational) may have greater risk for poor mental health than WWPAP participants. Similarly, a highly powered (1,338,143 adult participants) systematic review of 80 studies computed relative risks of all-cause mortality by domain of PA. Their findings suggested increases in total PA were protective in all domains, decreasing the risk of all-cause mortality by 36% in utilitarian, 26% in LTPA, 17% in occupational, and 12% in transport. While they did not test for differences between domain, their results suggest PA may be more protective in certain domains over others.[14] This provides further evidence of health inequality in a workplace wellness program because although any domain of PA is protective, the employees in the non-participant sample, with significantly higher occupational PA, which is less protective at reducing all-cause mortality than those who engage in more LTPA like that provided by the WWPAP. These domain-specific relationships between PA and mental health should be further explored to inform the development of worksite wellness interventions and programing.

Future research should investigate systemic approaches to improve participation in a WWPAP by all employees, particularly blue-collar workers and workers with lower education. Due to the higher risk of mental illness with higher occupational PA, perhaps organizations should offer more resources and programming to address non-PA outcomes including mental health.

CONCLUSIONS

This thesis provides insight into participation in a workplace wellness program from the perspectives of the employees at the university who voluntarily do and do not participate in the programs' PA offerings. Need for autonomy was unmet in WWPAP participants, which questions if the mechanism is attributed to the structures of the WWPAP, to PA itself. This study focused solely on the PA component of the workplace wellness program. Therefore, future investigators should assess how participation in different components of the wellness program affects employee health and wellbeing. I had adapted the MPAM-R tool to assess satisfaction of motivational needs, which provides an implication for future research to develop a novel and validated too to assess satisfaction of motivation of psychological needs. Finally, investigators and directors of wellness programs should investigate ways to improve participation in all components of their programs.

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APPENDIX

Appendix 1: 2017 All WWPAP Participant Data Collection Instrument

Survey Information

You are invited to take part in a research survey about a psychological comparison between individual and group fitness physical activity among corporate wellness members. Your participation will require approximately 15-25 minutes and is completed online at your computer. There are no known risks or discomforts associated with this survey. This study will provide insight to practitioners to understand the psychological needs of individuals or group fitness participants to maintain a behavior, therefore practitioners may be able to better provide counseling recommendations specific to that client or patient. Taking part in this study is completely voluntary. If you choose to be in the study you can withdraw at any time without adversely affecting your relationship with anyone at Cornell University. Your responses will be kept strictly confidential, and digital data will be stored in secure, password-protected, computer files. The main researcher conducting this study is *Hannah Feinberg,* a *graduate student and dietetic intern,* at Cornell University. If you have questions, you may contact *Hannah Feinberg* at *hdf26@cornell.edu* or at *518-637-4422.* If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) for Human Participants at 607-255-6182 or access their website at http://www.irb.cornell.edu. You may also report your concerns or complaints anonymously through Ethicspoint online at www.hotline.cornell.edu or by calling toll free at 1-866-293-3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured. Please feel free to print a copy of this consent page to keep for your records.

Clicking the "Click to Continue" button below indicates that you are 18 years of age or older, and indicates your consent to participate in this survey.

1. Which do you consider your primary activity?
    a. Available options include Spinning, Strength Training, H.I.I.T, Sit & Be Fit, Ripples, Muscle Pump, TRX, Zumba, Yoga, Pilates, Strength & Balance, Barre, Body Blast, ShockWave, Dance, Abs+, Pure Strength, Tai Chi, Aqua Zumba, Hydro Training, Swimming, Biking, Running, Walking, Elliptical, Rowing, Cross Fit, Weight lifting, Rock Climbing, Sailing, Windsurfing, Skiing, Cross Country Skiing, Snowshoeing, other (fill in)
2. Please indicate how many hours you perform <insert primary activity> each week.
    a. Options include 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, 6 hours, 7 hours, 8 hours, 9 hours, more than 10 hours.
3. Rank your preference of exercise locations.
    a. Cornell Fitness Centers
    b. Group Fitness Room
    c. Outdoors
    d. Another fitness center (not at Cornell)
    e. Other

The following is a list of **reasons why** people engage in physical activities, sports and exercise. Keeping in mind your primary physical activity/sport, respond to each question (using the scale given), on the basis of how true that response is for you.

Scale: 1 (not at all true for me), 2, 3, 4, 5, 6, 7 (very true for me)

I engage in <insert primary activity> because:

1. I want to be physically fit.
2. It's fun.
3. I like engaging in activities which physically challenge me.
4. I want to obtain new skills.
5. I want to lose or maintain weight so I look better.
6. I want to be with my friends.
7. I like to do <insert primary activity>.
8. I want to improve existing skills
9. I like the challenge.
10. I want to define my muscles so I look better.
11. It makes me happy.
12. I want to keep up my current skill level.
13. I want to have more energy.
14. I like activities which are physically challenging.
15. I like to be with others who are interested in this activity.
16. I want to improve my cardiovascular fitness.
17. I want to improve my appearance.
18. I think it's interesting.
19. I want to maintain my physical strength to live a healthy life.
20. I want to be attractive to others.
21. I want to meet new people.
22. I enjoy this activity.
23. I want to maintain my physical health and well-being.
24. I want to improve my body shape.
25. I want to get better at <insert primary activity>.
26. I find <insert primary activity> stimulating.
27. I will feel physically unattractive if I don't.
28. My friends want me to.
29. I like the excitement of participation.
30. I enjoy spending time with others doing this activity.

1. What is your age?
    a. Input number
2. What is your sex?
    a. Male
    b. Female
    c. Other

3. Are you Hispanic or Latino?
    a. Yes
    b. No
4. What is your race?
    a. American Indian
    b. Alaska Native
    c. Asian
    d. Black/ African American
    e. Native Hawaiian/ Other Native Pacific Islander
    f. White
    g. Other
5. What is the highest degree or level of school you have completed?
    a. No schooling completed
    b. Nursery school to 8th grade
    c. Some high school, no diploma
    d. High school graduate, diploma or the equivalent
    e. Some college credit, no degree
    f. Trade/technical/vocational training
    g. Associate degree
    h. Bachelor's degree
    i. Master's degree
    j. Professional degree
    k. Doctorate degree
6. What is your marital status?
    a. Single, never married
    b. Married or domestic partnership
    c. Widowed
    d. Divorced
    e. Separated
7. Are you an employee, retiree, or spouse/partner?
    a. Employee
    b. Retiree
    c. Spouse/partner
8. If you are an employee or retiree are you/ were you faculty or staff?
    a. Faculty
    b. Non-Faculty, academic
    c. Staff
9. If you are an employee, are you exempt or non-exempt?
    a. Exempt
    b. Non-Exempt
10. If you are an employee, are you an employee of the endowed university or a contract college?
    a. Endowed
    b. Contract
11. If you are a contract college employee, which college are you employed by?
    a. College of Agriculture and Life Sciences

b. College of Human Ecology
c. College of Industrial and Labor Relations
d. College of Veterinary Medicine

The following is a list of **possible outcomes** from physical activities, sports and exercise. Keeping in mind your primary physical activity/sport, respond to each question (using the scale given), on the basis of how true that response is for you.

Scale: 1 (not at all true for me), 2, 3, 4, 5, 6, 7 (very true for me)

Since I started <insert primary activity>, I:

1. Am physically fit.
2. Have fun.
3. Have been engaged in <insert primary activity>, which physically challenges me.
4. Have obtained new skills.
5. Have lost or maintained my weight and look better.
6. Have spent time doing <insert primary activity>, with my friends.
7. Have liked this activity.
8. Have improved existing skills.
9. Have been challenged.
10. Have more defined muscles and look better.
11. Have been happier.
12. Have maintained my current skill level.
13. Have more energy.
14. Have been physically challenged.
15. Have been with others who are interested in <insert primary activity>.
16. Have improved my cardiovascular fitness.
17. Have improved my appearance.
18. Remain interested in <insert primary activity>.
19. Have maintained my physical strength, enabling myself to live a healthy life.
20. Am more attractive to others.
21. Have met new people while <insert primary activity>.
22. Have enjoyed <insert primary activity>.
23. Have maintained my physical health and well-being.
24. Have improved my body shape.
25. Have become better <insert primary activity>.
26. Remain stimulated by <insert primary activity>.
27. Feel physically unattractive when I don't <insert primary activity>.
28. Have fulfilled my friends desire for me to participate.
29. Remain excited to participate.
30. Have enjoyed spending time with others doing this activity.

Appendix 2: 2018 Follow-Up WWPAP Participant Data Collection Instrument

Survey Information

You are invited to take part in a research survey that is assessing the types of physical activity employees engage in and their motivations to being physically active. Your participation will require approximately 15-25 minutes and is completed online at your computer. There are no known risks or discomforts associated with this survey. A benefit to completing this survey is being entered into a drawing to win one $100 gift card. This study will provide insight to practitioners to understand the psychological needs of individuals or group fitness participants to maintain a behavior, therefore practitioners may be able to better provide counseling and programming recommendations specific to that client or patient. Taking part in this study is completely voluntary. If you choose to be in the study you can withdraw at any time without adversely affecting your relationship with anyone at Cornell University. Your responses will be kept strictly confidential, and digital data will be stored in secure, password-protected, computer files. The main researcher conducting this study is *Hannah Feinberg,* a *graduate student,* at Cornell University. If you have questions, you may contact *Hannah Feinberg* at *hdf26@cornell.edu* or at *518-637-4422.* If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) for Human Participants at 607-255-6182 or access their website at http://www.irb.cornell.edu. You may also report your concerns or complaints anonymously through Ethicspoint online at www.hotline.cornell.edu or by calling toll free at 1-866-293-3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured. Please feel free to print a copy of this consent page to keep for your records.

Clicking the "Click to Continue" button below indicates that you are 18 years of age or older, and indicates your consent to participate in this survey.

Page 2

1. 12 months ago, you said <insert last year primary activity> was your primary activity and you performed <insert primary activity> for <insert hours performed> each week. Is this still the case?
    a. Yes
    b. No

***click button to continue to next page**

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We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7**

days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days. Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

Part 1: Job- Related Physical Activity

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?
    a. Yes
    b. No (Skip to PART 2: TRANSPORTATION)

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time
    a. ___ **days per week**
    b. No vigorous job-related physical activity (Skip to question 4)
3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?
    a. ___ **hours per day**
    b. ___ **minutes per day**
4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.
    a. ___ **days per week**
    b. No moderate job-related physical activity (Skip to question 6)
5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?
    a. ___ **hours per day**
    b. ___ **minutes per day**
6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.
    a. ___ **days per week**
    b. No job-related walking (Skip to PART 2: TRANSPORTATION)
7. How much time did you usually spend on one of those days **walking** as part of your work?
    a. ___ **hours per day**

b. ___**minutes per day**

Part 2: Transportation Physical Activity
These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days,** on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?
    a. ___ **days per week**
    b. No traveling in a motor vehicle (Skip to question 10)
9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?
    a. ___ **hours per day**
    b. ___ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place?**
    a. ___ **days per week**
    b. No bicycling from place to place (Skip to question 12)
11. How much time did you usually spend on one of those days to **bicycle** from place to place?
    a. ___ **hours per day**
    b. ___ **minutes per day**
12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place?**
    a. ___ **days per week**
    b. No walking from place to place (Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY)
13. How much time did you usually spend on one of those days walking from place to place?
    a. ___ **hours per day**
    b. ___ **minutes per day**

Part 3: Housework, House Maintenance, and Caring for Family
This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or dinning **in the garden or yard**?
    a. ___ **days per week**
    b. No vigorous activity in garden or yard (Skip to question 16)

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?
    a. ___ **hours per day**
    b. ___ **minutes per day**
16. Again, think about those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?
    a. ___ **days per week**
    b. No moderate activity in garden or yard (Skip to question 18)
17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?
    a. ___ **hours per day**
    b. ___ **minutes per day**
18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?
    a. ___ **days per week**
    b. No moderate activity inside home (Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY)
19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?
    a. ___ **hours per day**
    b. ___ **minutes per day**

Part 4: Recreation, Sport, and Leisure-Time Physical Activity

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?
    a. ___ **days per week**
    b. No walking in leisure time (Skip to question 22)
21. How much time did you usually spend on one of those day **walking** in your leisure time?
    a. ___ **hours per day**
    b. ___ **minutes per day**
22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?
    a. ___ **days per week**
    b. No vigorous activity in leisure time (Skip to question 24)
23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?
    a. ___ **hours per day**
    b. ___ **minutes per day**

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days** on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in **your leisure time**?
    a. **___ days per week**
    b. No moderate activity in leisure time (Skip to PART 5: TIME SPENT SITTING)
25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
    a. **___ hours per day**
    b. **___ minutes per day**

Part 5: Time Spent Sitting

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?
    a. **___ hours per day**
    b. **___ minutes per day**
27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?
    a. **___ hours per day**
    b. **___ minutes per day**

***click button to continue to next page**

Page 4

The following is a list of **possible outcomes** from physical activities, sports and exercise. Keeping in mind your primary physical activity/sport, respond to each question (using the scale given), on the basis of how true that response is for you.

Scale: 1 (not at all true for me), 2, 3, 4, 5, 6, 7 (very true for me)

Since I started <insert primary activity>, I:

31. Am physically fit.
32. Have fun.
33. Have been engaged in <insert primary activity>, which physically challenges me.
34. Have obtained new skills.
35. Have lost or maintained my weight and look better.
36. Have spent time doing <insert primary activity>, with my friends.
37. Have liked this activity.
38. Have improved existing skills.
39. Have been challenged.
40. Have more defined muscles and look better.
41. Have been happier.
42. Have maintained my current skill level.
43. Have more energy.
44. Have been physically challenged.

45. Have been with others who are interested in <insert primary activity>.
46. Have improved my cardiovascular fitness.
47. Have improved my appearance.
48. Remain interested in <insert primary activity>.
49. Have maintained my physical strength, enabling myself to live a healthy life.
50. Am more attractive to others.
51. Have met new people while <insert primary activity>.
52. Have enjoyed <insert primary activity>.
53. Have maintained my physical health and well-being.
54. Have improved my body shape.
55. Have become better <insert primary activity>.
56. Remain stimulated by <insert primary activity>.
57. Feel physically unattractive when I don't <insert primary activity>.
58. Have fulfilled my friends desire for me to participate.
59. Remain excited to participate.
60. Have enjoyed spending time with others doing this activity.

***click button to continue to next page**

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TECHNOLOGY QUESTIONS

1. Which of the following do you use with regards to physical activity?
    a. Something to track your fitness, including an app on your smartphone or a tracking device such as a fitbit, smartwatch, Garmin, etc.
    b. A physical activity group on social media. (Facebook, Instagram, Weight Watchers, Group Me, Strava, etc.)
    c. Follow a fitness account on Instagram, Facebook, YouTube, Blogs, or any other media outlet?
    d. Other (please explain)

The following is a list of statements regarding your use of technology and physical activity. Using the scale given, respond to each question on the basis of how true that response is for you.

Scale: 1 (not at all true for me), 2, 3, 4, 5, 6, 7 (very true for me)

If you use a fitness tracking device, answer the following questions, if not, skip to the next set of questions.

2. My fitness tracking device has stimulated my interest in physical activity.
3. My fitness tracking device has improved my skill at physical activity.
4. My fitness tracking device has connected me with other people doing physical activity.

If you use an Instagram account and follow fitness accounts, answer the following questions, if not, skip to the next set of questions.

5. My Instagram account has stimulated my interest in physical activity.
6. My Instagram account has improved my skill at physical activity.
7. My Instagram account has connected me with other people doing physical activity.

If you use a Facebook group with other people who are physically active, answer the following questions, if not, skip to the next set of questions.

8. My Facebook group has stimulated my interest in physical activity.
9. My Facebook group has improved my skill at physical activity.
10. My Facebook group has connected me with other people doing physical activity.

***click button to continue to next page**

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Thank you for participating in graduate research!

Appendix 3: 2018 Non-Participant Data Collection Instrument

Survey Information

You are invited to take part in a research survey that is assessing the types of physical activity employees engage in and their motivations to being physically active. Your participation will require approximately 15-25 minutes and is completed online at your computer. There are no known risks or discomforts associated with this survey. A benefit to completing this survey is being entered into a drawing to win one $100 gift card. This study will provide insight to practitioners to understand the psychological needs of individuals or group fitness participants to maintain a behavior, therefore practitioners may be able to better provide counseling and programming recommendations specific to that client or patient. Taking part in this study is completely voluntary. If you choose to be in the study you can withdraw at any time without adversely affecting your relationship with anyone at Cornell University. Your responses will be kept strictly confidential, and digital data will be stored in secure, password-protected, computer files. The main researcher conducting this study is *Hannah Feinberg,* a *graduate student,* at Cornell University. If you have questions, you may contact *Hannah Feinberg* at *hdf26@cornell.edu* or at *518-637-4422.* If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) for Human Participants at 607-255-6182 or access their website at http://www.irb.cornell.edu. You may also report your concerns or complaints anonymously through Ethicspoint online at www.hotline.cornell.edu or by calling toll free at 1-866-293-3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured. Please feel free to print a copy of this consent page to keep for your records.

Clicking the "Click to Continue" button below indicates that you are 18 years of age or older, and indicates your consent to participate in this survey.

***click button to continue to next page**

Page 2

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days.** Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days. Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

Part 1: Job- Related Physical Activity

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring

for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?
    a. Yes
    b. No (Skip to PART 2: TRANSPORTATION)

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time
    a. ___ **days per week**
    b. No vigorous job-related physical activity (Skip to question 4)
3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?
    a. ___ **hours per day**
    b. ___ **minutes per day**
4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.
    a. ___ **days per week**
    b. No moderate job-related physical activity (Skip to question 6)
5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?
    a. ___ **hours per day**
    b. ___ **minutes per day**
6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.
    a. ___ **days per week**
    b. No job-related walking (Skip to PART 2: TRANSPORTATION)
7. How much time did you usually spend on one of those days **walking** as part of your work?
    a. ___ **hours per day**
    b. ___**minutes per day**

Part 2: Transportation Physical Activity

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days,** on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?
    a. ___ **days per week**
    b. No traveling in a motor vehicle (Skip to question 10)
9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?

a. ___ **hours per day**
b. ___ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place?**
    a. ___ **days per week**
    b. No bicycling from place to place (Skip to question 12)
11. How much time did you usually spend on one of those days to **bicycle** from place to place?
    a. ___ **hours per day**
    b. ___ **minutes per day**
12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place?**
    a. ___ **days per week**
    b. No walking from place to place (Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY)
13. How much time did you usually spend on one of those days walking from place to place?
    a. ___ **hours per day**
    b. ___ **minutes per day**

Part 3: Housework, House Maintenance, and Caring for Family

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or dinning **in the garden or yard**?
    a. ___ **days per week**
    b. No vigorous activity in garden or yard (Skip to question 16)
15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?
    a. ___ **hours per day**
    b. ___ **minutes per day**
16. Again, think about those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?
    a. ___ **days per week**
    b. No moderate activity in garden or yard (Skip to question 18)
17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?
    a. ___ **hours per day**
    b. ___ **minutes per day**

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?
    a. **___ days per week**
    b. No moderate activity inside home (Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY)
19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?
    a. **___ hours per day**
    b. **___ minutes per day**

Part 4: Recreation, Sport, and Leisure-Time Physical Activity

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?
    a. **___ days per week**
    b. No walking in leisure time (Skip to question 22)
21. How much time did you usually spend on one of those day **walking** in your leisure time?
    a. **___ hours per day**
    b. **___ minutes per day**
22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?
    a. **___ days per week**
    b. No vigorous activity in leisure time (Skip to question 24)
23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?
    a. **___ hours per day**
    b. **___ minutes per day**
24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days** on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in **your leisure time**?
    a. **___ days per week**
    b. No moderate activity in leisure time (Skip to PART 5: TIME SPENT SITTING)
25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
    a. **___ hours per day**
    b. **___ minutes per day**

Part 5: Time Spent Sitting

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting

friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?
    a. **___ hours per day**
    b. **___ minutes per day**
27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?
    a. **___ hours per day**
    b. **___ minutes per day**

***click button to continue to next page**

Page 3

The following is a list of **reasons why** people engage in physical activities, sports and exercise. Keeping in mind your primary physical activity/sport, respond to each question (using the scale given), on the basis of how true that response is for you.

Scale: 1 (not at all true for me), 2, 3, 4, 5, 6, 7 (very true for me)

I engage in <insert primary activity> because:

31. I want to be physically fit.
32. It's fun.
33. I like engaging in activities which physically challenge me.
34. I want to obtain new skills.
35. I want to lose or maintain weight so I look better.
36. I want to be with my friends.
37. I like to do <insert primary activity>.
38. I want to improve existing skills
39. I like the challenge.
40. I want to define my muscles so I look better.
41. It makes me happy.
42. I want to keep up my current skill level.
43. I want to have more energy.
44. I like activities which are physically challenging.
45. I like to be with others who are interested in this activity.
46. I want to improve my cardiovascular fitness.
47. I want to improve my appearance.
48. I think it's interesting.
49. I want to maintain my physical strength to live a healthy life.
50. I want to be attractive to others.
51. I want to meet new people.
52. I enjoy this activity.
53. I want to maintain my physical health and well-being.
54. I want to improve my body shape.
55. I want to get better at <insert primary activity>.
56. I find <insert primary activity> stimulating.
57. I will feel physically unattractive if I don't.
58. My friends want me to.
59. I like the excitement of participation.

60. I enjoy spending time with others doing this activity.

***click button to continue to next page**

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Demographics

12. What is your age?
    a. Input number
13. What is your sex?
    a. Male
    b. Female
    c. Other
14. Are you Hispanic or Latino?
    a. Yes
    b. No
15. What is your race?
    a. American Indian
    b. Alaska Native
    c. Asian
    d. Black/ African American
    e. Native Hawaiian/ Other Native Pacific Islander
    f. White
    g. Other
16. What is the highest degree or level of school you have completed?
    a. No schooling completed
    b. Nursery school to 8th grade
    c. Some high school, no diploma
    d. High school graduate, diploma or the equivalent
    e. Some college credit, no degree
    f. Trade/technical/vocational training
    g. Associate degree
    h. Bachelor's degree
    i. Master's degree
    j. Professional degree
    k. Doctorate degree
17. What is your marital status?
    a. Single, never married
    b. Married or domestic partnership
    c. Widowed
    d. Divorced
    e. Separated
18. Are you an employee, retiree, or spouse/partner?
    a. Employee
    b. Retiree
    c. Spouse/partner
19. If you are an employee or retiree are you/ were you faculty or staff?
    a. Faculty
    b. Non-Faculty, academic
    c. Staff
20. If you are an employee, are you exempt or non-exempt?

    a. Exempt
    b. Non-Exempt
21. If you are an employee, are you an employee of the endowed university or a contract college?
    a. Endowed
    b. Contract
22. If you are a contract college employee, which college are you employed by?
    a. College of Agriculture and Life Sciences
    b. College of Human Ecology
    c. College of Industrial and Labor Relations
    d. College of Veterinary Medicine

***click button to continue to next page**

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Thank you for participating in graduate research!